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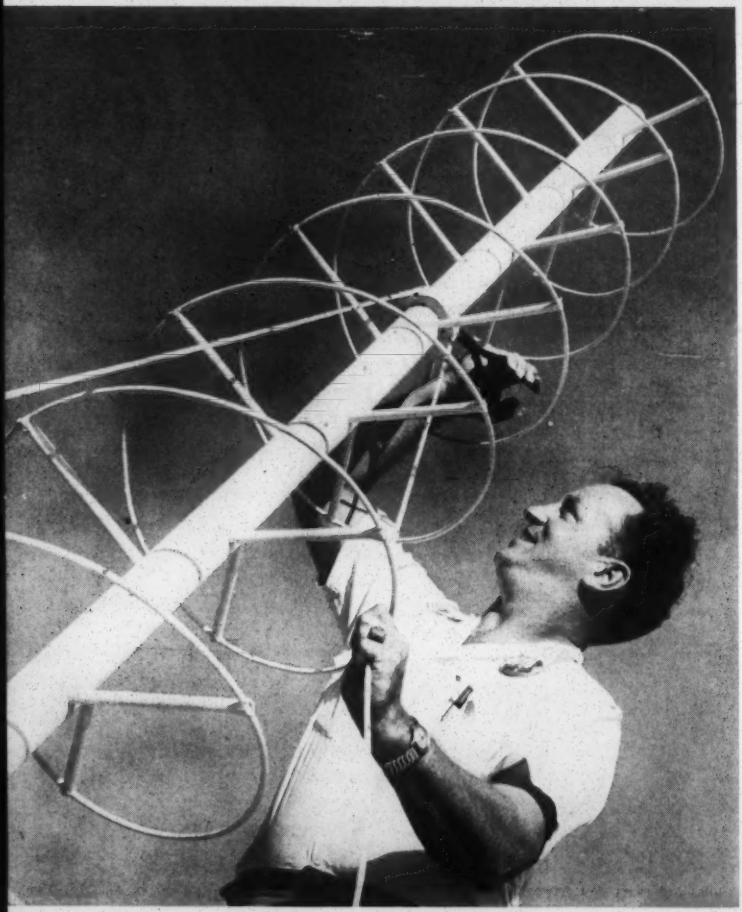


313 U. S. NAVY

ANTENNAS keep tabs on every phase of a satellite's life. This one, atop a blockhouse at Cape Canaveral, Florida, receives performance data of test rockets. Others pick up the satellite's signal from launching to orbit. With electronic ears they trace the path and unscramble the maze of radio messages giving scientific details on conditions in space (page 318).

► Strife-torn Sumatra

► French Mark 2,000 Years for Lyon

► Tracking a Satellite

► Early *Explorers*

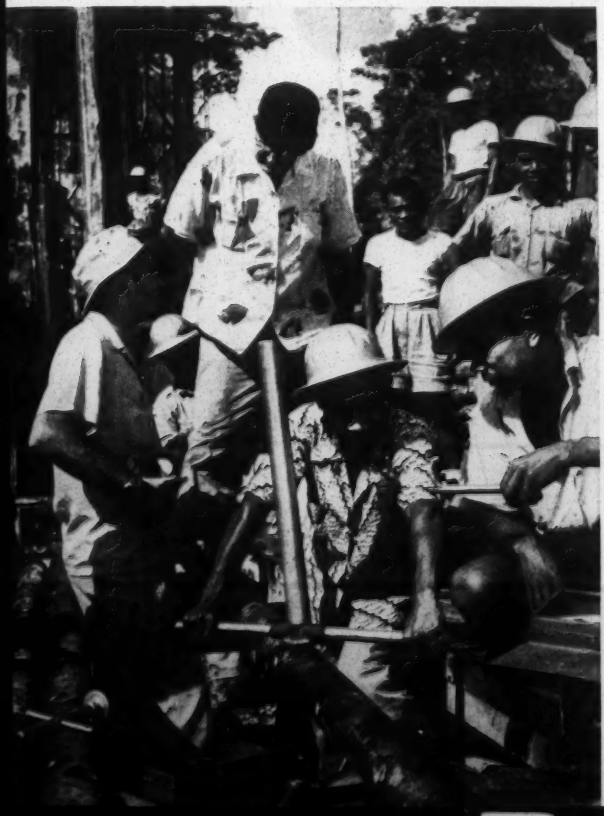
► Guatemala

NEXT WEEK—a salute to James Monroe, fifth President and author of the Monroe Doctrine, on his 200th birthday.

not to mention elephants, rhinoceroses, and tigers.

This central plain provides the island with bountiful natural products, her traditional exports. For miles around the busy city of Medan, in the north, stretch plantations producing rubber, copra, tobacco, tea, and sisal. Most were begun by former Dutch colonists.

Medan itself is vigorously progressive. Eighty years ago it was a tiny *kampung* (village). Now half a million people shuffle along its wide streets. Its crowded market gives the visitor an idea of Sumatra's various ethnic groups. Malays, Bataks, Achinese, and Javanese grew up on the island; Sikhs and Tamils from India, and Chinese, joined them later. The



big Medan mosque, with its cream-colored walls and pale-blue tiles, is one of many welcoming Sumatra's Moslem millions.

South of Medan the rolling plain masks deposits of oil and tin, some coal, and iron ore. Sumatra, in fact, ranks as the principal source of oil in the southeast Asian area.

Little known to the outside world before recent headlines, the cities of Pakanbaru in central Sumatra and Palembang in the south are major oil hubs. American drillers, roughnecks, and roustabouts mingle with eager, intelligent Sumatrans. U. S. cars and motor scooters compete with traditional horse-drawn *bendis* on the streets. At night, refineries cast their fiery glow.

Crews push rigs deep into surrounding jungle. At left a native team, supervised by an

Sumatra

Civil War Disrupts Island's Search For a Better Life

ILLUSTRATIONS BY NATIONAL GEOGRAPHIC PHOTOGRAPHER JOSEPH BAYLOR ROBERTS

IT IS over rugged mountains and canyons like this that Indonesia's federal troops must trudge if they hope to subdue the rebellious citizens of the new Republic's western island, Sumatra.

Not far from this valley, squatting high in the hills between two volcanoes, one active and the other dormant, is the rebel capital of Bukittingi. Here independence-minded leaders plot military campaigns in an unlikely setting. Past their windows whole families stroll to the market place dressed in gay wrap-around tunics and ankle-length trousers. Brisk bargaining takes place between umbrellas designed to protect merchant stalls equally well from the hot sun or a sudden downpour. Palm fronds wave above house roofs that taper upward at the ends, inspired by the horns of the buffalo.

Sumatra's vigorous inhabitants, basically Malay, have never taken kindly to unwelcome pressure from any source, whether from Dutch colonizers, Japanese occupying forces, or the present ruling government on near-by Java. Today its leaders complain that although the island generates three-fourths of the Republic's foreign trade, it receives in benefits only a fraction of its earnings. Furthermore, they are uneasy at President Sukarno's increasing friendliness with left-wing and communist groups.

Larger in area than California, Sumatra is truly one of the world's fascinating economic frontiers. Only in this century have its citizens begun to turn their rich resources to productive use.

The predominant feature on its geographic face is the long, jungle-spotted plain that stretches the length of the 1,100-mile island. Fertile land sweeps from the mountains along the Indian Ocean to the mangrove swampland fringing the eastern side. Much of it has been scarcely touched by a plow. Some 60 percent of the area lies shadowed by virgin forest, its dark recesses hiding valuable hardwoods, resins, and gums—

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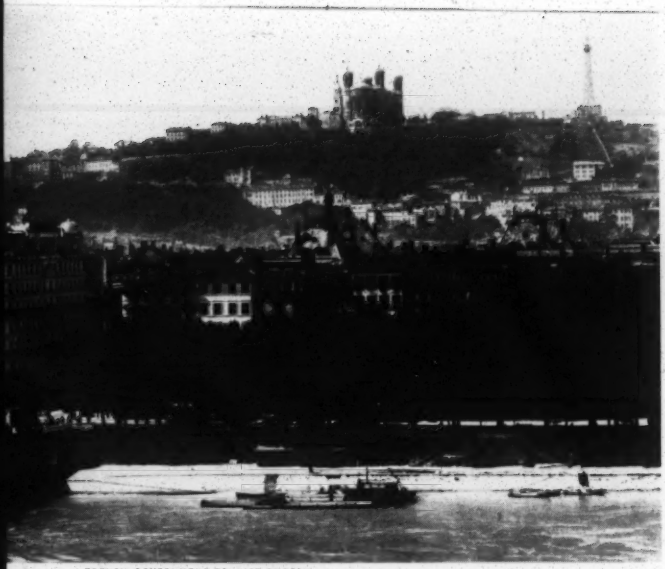


FRENCH GOVERNMENT TOURIST BUREAU

TWENTY centuries ago Munatius Plancus, a friend of the Roman historian, Cicero, planted a colony in Gaul. He chose a hill overlooking the junction of two rivers.

Gaul became France and the settlement, Lyon, prospered at its natural crossroad. The hill where the Roman seed was sown still dominates the French city. Atop stands Notre Dame de Fourvière.

LYON—2,000 Years Old

SHOULD the famed chefs of Lyon, France, bake a birthday cake for their city they'd need 2,000 candles. As Lyon passes its second millenium, some half a million citizens will celebrate this year with parades, religious services, a fair, and operas to be held in the Roman theatre where gladiators once bled.

Lyon's buildings, old and new, cluster where the quiet Saône joins the Rhône, tumbling from the Alps. The rivers, navigable for some 200 and 300 miles, respectively, formed natural roadways for ancient craft. Now steamboats and barges plow them, pausing to load at the city's quays. Railroads, descended from the first in France which started in Lyon in 1823, move the produce of smoke-belching factories. For besides being 2,000 years old, Lyon ranks as France's chief manufacturing and trading center and rivals Marseille as the nation's second largest city after Paris.

To Lyon's favored site trooped early Segusians, a Gallic tribe. Phoenicians may have paused there. Around 43 B.C. the Roman colony was established. Emperor Augustus made it his official residence in Gaul. It was called Lugdunum, back then, and from it radiated military highways to the English Channel, the Bay of Biscay, the Rhine, and the Mediterranean.

Lugdunum, with its senate, its theatre, temples, and aqueducts, was one of Gaul's show places, according to Seneca, the Stoic philosopher. Fire ravaged the city in A.D. 60, shortly before Rome itself burned. Nero (who later fiddled through Rome's flames) contributed to Lugdunum's rebuilding.

Christianity replaced Lyon's pagan gods. The church of St. Martin d'Ainay has beckoned worshippers since the 800's. The Renaissance brought a printing industry that still thrives. Rabelais, a Lyon doctor, wrote rollicking tales that still hold readers. The city's well-known silk business sprang from a factory founded by Louis XI, five hundred years ago. Other textiles and synthetics flourish beside silk today. In the field of science, André Marie Ampère, early 19th century physicist and mathematician, discovered the relationship between electricity and magnetism. His name lives on as the unit of measurement of electrical intensity.

S.H.

UMI

AD VAN BANNEKOM

American driller (center) and a French specialist, prepares to "shoot" a new well near Pakanbaru. Once the well has been brought in, the derrick will be struck like a circus tent and moved to the next job.

Crude or refined petroleum—like Sumatra's fine cigar tobacco the young lady at left is busily sorting—goes to market down east coast rivers. The sarsaparilla-colored waterways still provide the most reliable means of transportation. Railways are scarce, airlines in their infancy. Even roads are uncertain. One recent traveler estimates that a hardy tourist or businessman could jounce his way the length of Sumatra in perhaps seven days. But he is not convinced that the shaking up would make it worthwhile.

All over the island, Sumatrans seem to have caught the fever of a better tomorrow. Islanders impress visitors with their frontier air. Before civil war interrupted the movement, many rice farmers "transmigrated" from crowded Java to ply their trade on south Sumatra's newly irrigated paddies or *suwahs*. In the towns, officials skip the traditional long afternoon nap, keep their doors open for business.

The fighting, of course, has siphoned off much of this energy. But Sumatrans are convinced that the political storm will pass like a monsoon rain and economic skies will brighten again. After all, they say, isn't their land called the "Island of Hope?" A.P.M.

GENDREAU

A LOFTY BATAK home in north Sumatra rears its high-peaked, saddle-shaped, thatched roof above the unpaved street. For years the Bataks kept to themselves, suspicious of outsiders. Now villagers, who work the tobacco, rubber, and palm oil plantations, welcome visitors. They build their houses on sturdy poles, carve them elaborately with beautiful designs inspired by their old culture.

As a whole, Sumatra lacks the uniform development and heavy population of much smaller Java, which counts more than 50 millions to Sumatra's 11,600,000. For a full description, read "This Young Giant, Indonesia," in the September, 1955, *National Geographic Magazine*. A story on Djakarta appeared in GSB, March 25, 1957.

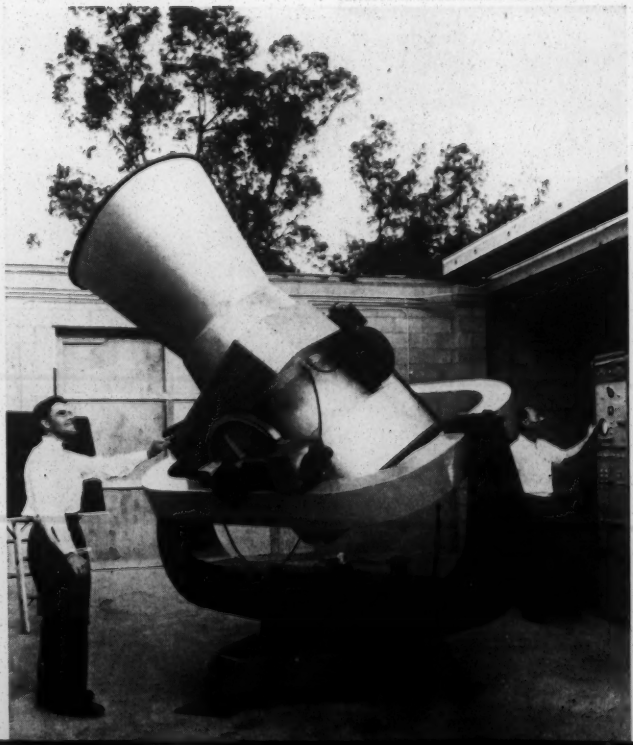
U. S. NAVY

MINITRACK stations receive the radio signals transmitted by IGY satellites. The first Soviet sputniks broadcast on lower frequencies. Their battery transmitters soon failed.

So far, American satellites have transmitted at frequencies of more than 100 million cycles per second—far higher than can be picked up by most amateur short-wave sets. But the Minitrack stations, administered by the Naval Research Laboratory, are tuned to the signal of the tiny transmitter. The tracking van at left can record the satellite's position, then send the information to Naval Research Laboratory headquarters in Washington, D. C., where it helps fill in the complete picture of the distant orbit. Little Vanguard, with its solar-powered batteries is expected to transmit for months, even years.

The *National Geographic Magazine* has followed closely developments in this and other aspects of the International Geophysical Year. IGY articles have appeared in February 1956, April 1956, August 1956, April 1957, July 1957, September 1957, December 1957, April 1958.

SMITHSONIAN ASTROPHYSICAL OBSERVATORY



TRACKING cameras like this Baker-Nunn type are able to pinpoint a satellite with great accuracy. They have far wider fields of vision than astronomical telescopes and are able to sweep the sky at the same speed as the slow passage of stars. Thus stars appear stationary on the film—while a satellite etches its straight line. A dozen of these cameras will be in operation in June. Camera stations are located in New Mexico, South Africa, Australia, Spain, Florida, Iran, Argentina, India, Peru, Japan, Netherlands West Indies, and Hawaii. E.P.

KEEPING TABS ON SATELLITES

IGY SATELLITES capture headlines when they roar into orbit. Then, during the months or even years that they circle the earth, they are apt to be forgotten. But scientists and devoted amateurs keep track of them, plotting their courses, watching for any gradual loss of altitude, and above all, compiling the records of space that they radio down to earth. With every dribble of information about satellites, science fills its reservoir of facts. Without help from sky watchers, amateur and professional, all over the world, the facts would be painfully slow in mounting up —and man's plans to conquer space might languish.

The Smithsonian Institution Astrophysical Observatory in Cambridge, Mass., coordinates visual sightings. Working with it is the National Geographic Society. One of the Society's top cartographers, Wellman Chamberlin, has invented a visual tracking device that quickly points out an existing orbit for telescopic cameras to pinpoint.

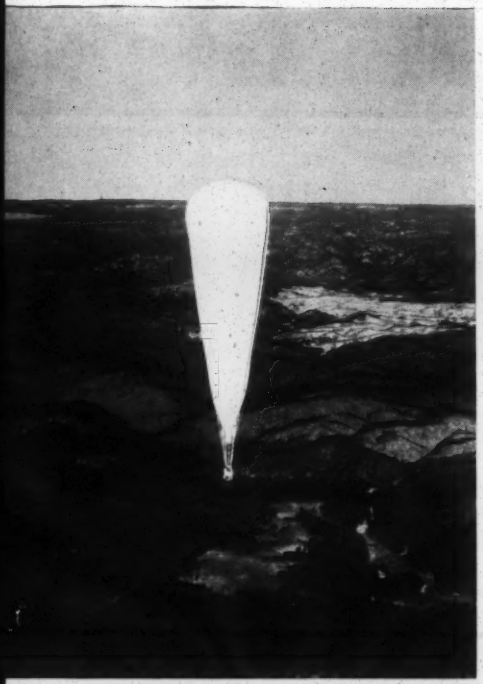
NATIONAL GEOGRAPHIC PHOTOGRAPHER B. ANTHONY STEWART

THREE PROJECTS combine to track a satellite—Operation Moonwatch, Minitrack stations, and precision tracking by camera. Moonwatch depends on volunteers like those above and below. Each team of from 20 to more than 100 members takes up position at a line of low-power telescopes with overlapping fields of vision.

When a watcher picks up a moving blob that is a satellite, he tracks it until it passes a reference point such as the crossbar of a mast. At that instant, the watcher presses a buzzer. Distribution of different team signals charts the satellite's path.

Moonwatch teams are organized by the Smithsonian Institution Astrophysical Observatory and exist all over the world.

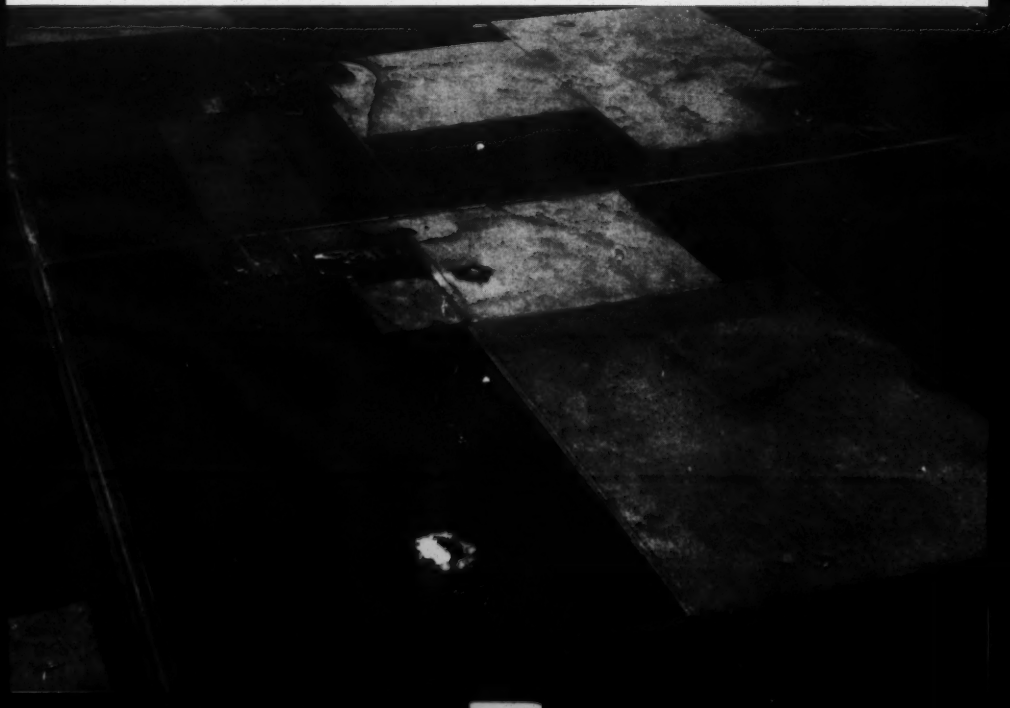
SAMUEL W. MATTHEWS, NATIONAL GEOGRAPHIC STAFF

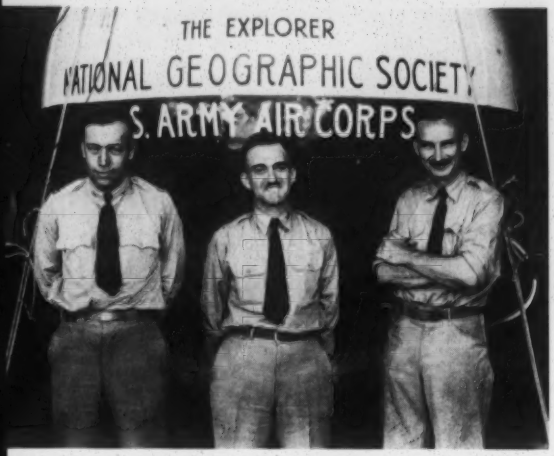


RINGED by lights, *Explorer I* underwent last-minute preparations for its flight to the fringe of the atmosphere in 1934. Early next morning it rose from a natural bowl in the Black Hills. Sealed inside the gondola, airmen could control ascent by valving off gas or dropping lead ballast.

PHOTOGRAPHS BY M SGT. G. B. GILBERT AND CAPT. H. K. BAISLEY

GAS EXPANDS as upper atmosphere thins out. At 60,613 feet, *Explorer I* ripped from gas pressure (right) and "parachuted" down. Crew stayed with it until the last minute, bailed out just before plummeting gondola struck (below).





EXCEPT for some frozen tracts of Antarctica, man has explored every region of his earth. But his newest frontier lies, surprisingly, less than 20 miles away—straight up. Balloons have carried him that far. Instrument-bearing satellites have probed farther yet into the unknown sky. And many of these vehicles have made famous an obvious name, *Explorer*, that earth-bound adventurers generally overlooked when christening their vessels. First sky-probing *Explorer* was this balloon gondola, sent aloft in 1934 by the Army and the National Geographic Society.

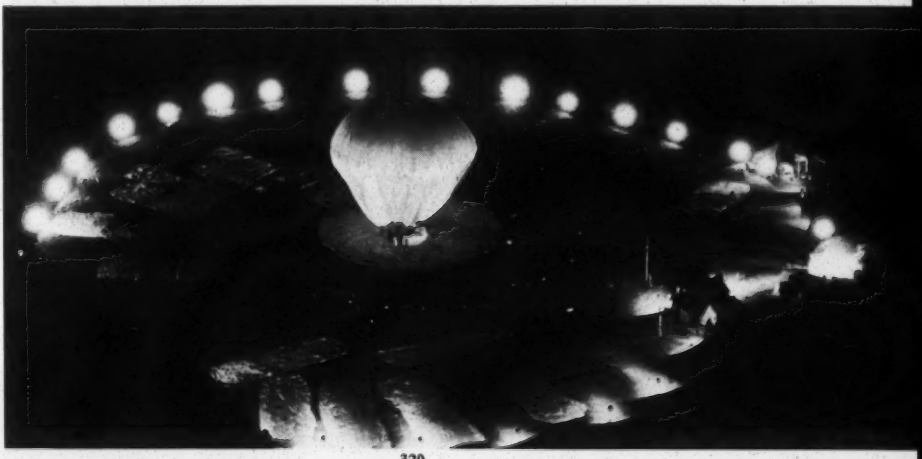
PHOTOGRAPHS BY RICHARD H. STEWART
NATIONAL GEOGRAPHIC STAFF

EXPLORER—A Grand Old Name

THE ARMY plans to send no more *Explorer* satellites into orbit. The scientific baby moons will now bear different names. So *Explorer I*, the first American satellite, and its fellows become part of history, joining the two man-carrying research balloons, *Explorer I* and *Explorer II*.

The original *Explorer I*, a huge hydrogen balloon, rose from the Black Hills of South Dakota on July 28, 1934, with Capt. Orvil Anderson, Maj. William Kepner, and Capt. Albert Stevens (left to right, above). The great gas bag reached 60,613 feet and gathered valuable scientific information before a sudden rent in the fabric brought it down and forced its occupants into a heart-stopping escape by parachute.

About a year later, *Explorer II*, also co-sponsored by the National Geographic Society, soared to 72,395 feet—a record that remained unbroken for 21 years. Another balloon namesake, *Explorer III*, is destined to take two Air Force parachutists to 90,000 feet for a jump.



HENRY CLAY GIPSON

coffee, tobacco, and fruit raising. Descendants of Indians and pioneer Spaniards take to forests to hew mahogany, bamboo, and oak, or to scar rubber trees.

Chicle tappers grope through the green twilight of scattered sapote trees bearing latex for chewing gum manufacture. Next Sunday these jungle workers may kneel with incense on the steps of Santo Tomás in Chichicastenango (above).

Populous in its southern mountains, Guatemala is sparsely settled in its northern Petén region, a 12,000-square-mile plainlike forest alive with jaguars, monkeys, deer, snakes, and turkeys. Here Mayas, "Greeks of the New World," left stately temples, plazas, and open-air ball courts where skilled athletes played a strange and difficult version of basketball.

Carved monuments (right) recording religious and historical events, are archeologists' treasures. Mysteriously, Mayas trekked gradually northward through the centuries, emerging finally in new splurges of building in Yucatan.

Guatemalans live 20th-century lives in their capital Guatemala City, astride a fertile plain 75 miles from the Pacific coast. Horn-sounding autos pant fumes on the brisk air 5,000 feet above sea level on the mountain spine of Central America. Asphalted avenues replace old cobbled streets. Suburbs finger outward between the fissures of deep ravines virtually surrounding the capital.

It takes a national income to afford so prosperous a central city. Agriculture supports the national economy, so far, though deposits of lead and copper await fuller development.

Earthquakes in 1917-18 resulted in nearly complete rebuilding of Guatemala City. Highway builders now battle the canyons and hills. Not far southwestward stand the volcanoes Fuego and Agua, fire and water, reminders of earth's latent fury. Only recently, Fuego erupted. S.H.

LUIS MARDEN, NATIONAL GEOGRAPHIC STAFF

UNICEF

Guatemala Finds Chance to Build

IT'S a hard climb, even for mountain-bred men. But what a scenic milk route for these Guatemalans plodding toward a village school with milk from the UN International Children's Emergency Fund (above). Behind them, mountain-cupped Lake Atitlán sparkles in a 1,500-foot-deep basin. Near-by valleys drape shawls of tropical greenery. Sun-splashed streams thrash down hillsides, drowning the cries of birds. Visitors rightly call mountainous Guatemala a tropical Switzerland.

Hard-handed rulers, revolts, and widespread illiteracy (despite free education) long impeded national progress. Communists infiltrated the government in 1951 and dictated policy until overthrown in 1954. During these three years the United States found itself a neighbor of the Western Hemisphere's first Soviet-oriented nation. Guatemala now lines up its some 3,000,000 citizens with the free world, according to President Miguel Ydígoras Fuentes. Yet the communist party remains strong.

This nation, Central America's largest in population, begins where Mexico's southern State of Chiapas takes a turtle-mouth bite into mid-Guatemala. Other neighbors are British Honduras, Honduras, El Salvador, and the blue wash of Pacific and Caribbean waves on coasts that are respectively 200 miles and 70 miles long.

Blessed with present political tranquility, Guatemalans are growing aware of many resources. Deep soil, rich with volcanic deposits, favors agricultural expansion. The people are long skilled in

GILES GREVILLE HEALEY (TOP); LUIS MARDEN, NATIONAL GEOGRAPHIC STAFF

MARKET PLACE at Momostenango, above, sells blankets to ward off the chill of 7,280-foot altitude. Buyers also seek straw hats to guard against the searing tropical sun. Rich-hued blanket dyes maintain a traditional love of color. Mayas used to wade into the ocean to get sacred purple from snails. But Guatemalans had to wait for Spanish sheep to arrive before discovering the attractions of wool. Markets like this help economy of a nation poor in coal, iron, and petroleum products.

THE QUETZAL, elegant with red breast and long tail, languishes in captivity. The two shown here are mounted. Understanding its love of freedom, Guatemalans have made this colorful jungle dweller their national bird. Its likeness adorns the quetzal—the Guatemalan dollar—and travels around the world on the nation's postage stamps.